Lesson 2.2: Limit Definition and Notation

For a function $f(x)$, if we can make the values of y arbitrarily close to some number L , by choosing values of x that are close enough to a, then we write:

$$\lim_{x \to a} f(x) = L$$

$$f(x) \to L \quad as \quad x \to a$$

Example 1

Evaluate $\lim_{x \to 1} \frac{x^2 - 1}{x - 1}$?

Predicting a Limit Numerically

Use a table of values to predict the value of $f(x)$ by choosing values of x that get increasing closer to 1 from the left and the right.

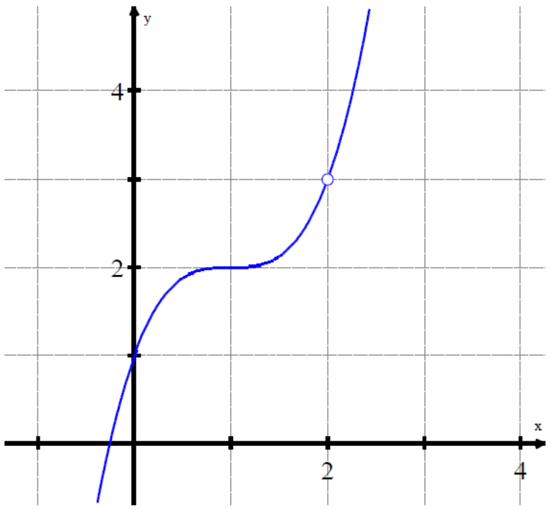
Think: Why not just find the function value?

x	y
0.8	
0.9	
0.99	
0.999	

x	y
1.2	
1.1	
1.01	
1.001	

Example 2

(a) Consider the function $y = f(x)$ and determine the $\lim_{x \to 2} f(x)$.



Use a Graph to Predict the Value of a Limit

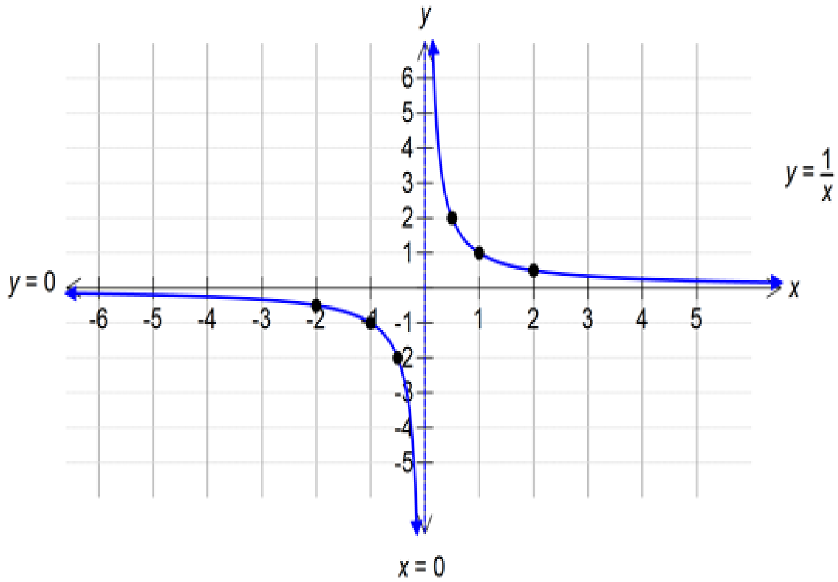
↳ follow the curve produced by $f(x)$ from the left and right towards $x = a$ and note the effect on the value of y.

$\lim_{x \to 2} f(x) = ?$

(b) Why doesn't it matter that there is a hole in the graph?

Example 3

Use the graph to evaluate the following limits:



(a) $\lim_{x \to 1^+} \frac{1}{x}$

(b) $\lim_{x \to 1^-} \frac{1}{x}$

(c) $\lim_{x \to 0^+} \frac{1}{x}$

(d) $\lim_{x \to 0^-} \frac{1}{x}$

(e) $\lim_{x \to \infty} \frac{1}{x}$

(f) $\lim_{x \to -\infty} \frac{1}{x}$